NOTES AND LITERATURE

SOME RECENT ADVANCES IN VERTEBRATE PALEONTOLOGY. II.

Waldemar Lindgren in a discussion of "The Tertiary Gravels of the Sierra Nevada of California,"[11] gives (p. 51) a brief review of the history of fossil mammals of the auriferous gravels of California. In this connection the author has touched on the age of the famous "Calaveras skull," which some have thought indicated a Tertiary age for man in California. The skull has in the past provoked much discussion and it is interesting to have new light brought forward. Mr. Lindgren, through his associate, Mr. J. M. Boutwell, interviewed some of the older residents of the region in which the "Calaveras skull" was found. One resident remembered the details of the "find" and stated to Mr. Boutwell that the mine in which the skull was found had been "salted" with the subsequently famous "Calaveras skull" as a practical joke by one of the neighborhood humorists. While this is not of very definite evidence for the non-Tertiary age of the "Calaveras skull" yet it fully sustains the important researches of Sinclair and Holmes, who could find no good evidence for the skull being other than that of the modern Indian.

The *Kansas University Science Bulletin* issued during the past summer contains three articles on fossil vertebrates. A new species of *Eryops* (*E. willistoni*) and the history of the development of our knowledge of the temnospondylous Amphibia is the subject-matter of one of the papers. The earliest known temnospondyle was described by Agassiz as a fish in 1777. The amphibian nature of the fossil was not noted until 1847 when it was correctly defined by Goldfuss and later by Jaeger. A list of 58 species is given, nearly or quite all of which belong with the Temnospondylia. The order Temnospondylia and the family Eryopidæ are defined and the geological range and geographical distribution given. The new temnospondyle (*Eryops willistoni*) is from the reputed Permian of Oklahoma. The species is quite distinct and the characters are shown in six plates of drawings of the skeletal remains.

An armored Dinosaur (*Stegopelta landerensis* Williston) is

[11] Prof. Paper 73, U. S. Geol. Surv.

described in another paper[12] and illustrated in five plates. The material is in the University of Chicago. The form is one of the later, peculiar, armored, bizarre, stegosaurian dinosaurs allied to *Polacanthus* of England, *Stereocephalus* of Canada, *Hierosaurus* of Kansas Niobrara Cretaceous, *Ankylosaurus* of Montana and other widely distributed genera of armored dinosaurs. The dinosaur was found in a marine deposit associated with plesiosaur remains. A short sketch of the horizon, the Hailey shales of the Wyoming Cretaceous, is given.

The soft parts of Cretaceous fishes are described and figured in the other paper,[13] and a new herring from the Cretaceous near Waco, Texas, is described as *Thrissopater intestinalis,* so called on account of the preservation of the intestines. The form is allied to *T. magnus* of the English Cretaceous. Another form of fish, identified provisionally as *Empo nepaholica* Cope, is represented by the cast of the stomach, a portion of the intestine and a pectoral fin with a few scales.

Dr. S. W. Williston has reviewed the question of the homology of the *wing finger* of Pterodactyls[14] and has given a new restoration of a pterodactyl as it probably appeared in life. The restoration is based on Dr. Williston's previous restoration of the skeleton of *Nyctosaurus gracilis* Marsh published in Eastman's translation of Zittel's "Paleontology" (II, 255).

The question which has interested anatomists for nearly a century is whether the wing finger of the pterodactyls is the fourth or fifth. There have been many arguments for each determination. Cuvier was the first who correctly interpreted the homology of the wing finger, basing his determination on the phalangeal formula of other reptiles. Plieninger has recently raised the question as to whether the interpretation of the phalangeal formula, 2, 3, 4, 5, 3 for the hand and 2, 3, 4, 5, 4 for the foot, is the primitive one for the Reptilia. Dr. Williston answers this question conclusively in the affirmative and quotes as evidence newly acquired facts from the Permian vertebrates of Texas and New Mexico. To substantiate his claim he figures the entire arm of three genera of Permian reptiles, *Limnoscelis, Ophiacodon* and *Varanosaurus.* In all of these genera, known from nearly perfect material, the phalangeal formula is as given above.

The author gives further notes on the function of the pteroid

[12] Vol. V, No. 14.

[13] Vol. V, No. 15.

[14] *Journ. Geol.,* XIX, 696–705, 4 figs.

bone, which has been interpreted as a vestige of the first finger. He considers it to be simply an ossified tendon supporting the patagial membrane running from the arm to the neck. He bases this conclusion on the relations of this structure in the well preserved skeleton of *Nyctosaurus* in the Field Museum fully described some few years ago by Dr. Williston.

In view of these facts there seems no longer to be any question that the wing finger of the pterodactyls is the *fourth*. The reduction of the phalanges of the wing finger from the primitive number of 5 to 4 is accounted for on the assumption that the claw of the finger has been lost as has the same structure in the bats. Further evidence is brought forth in the nature of the carpus to sustain the homology of the wing finger of the pterodactyls with the fourth digit of other reptiles.

The *Annals of the Queensland Museum*[15] contains two articles on fossil vertebrates by C. W. de Wis, former director of the museum. One of the papers describes a new species of bird, *Palæolestes gorei,* based on a single phalange. The specimen is carefully described, but the geological position is not given, the comparisons of the new form with other species of the same kind are not attempted so that one wonders just why the paper was published, since it really throws no new light on the subject excepting perhaps to extreme ornithological experts.

The same author in a few lines describes a new cestraciont fish from a single imperfect tooth. The form is insufficiently defined and no comparisons are given.

A new member of the theropodous Dinosauria has been described by Mignon Talbot[16] from remains discovered in an "erratic bowlder" of Connecticut Valley Triassic sandstone, which according to Talbot was carried two or three miles from its original source by the glacier. The stone contains the larger part of the skeleton of a small dinosaur of the carnivorous type, a member, undoubtedly, of those reptiles which made the so-called "bird-tracks" in the Connecticut Valley sandstone, so admirably described by Hitchcock, Lull and others. The find is a very unusual and exceedingly interesting one, since Triassic dinosaurs are not at all abundant. The animal when alive could not have been much larger than an ordinary-sized chicken, thus serving to restrain the common conception of dinosaur sizes.

[15] Brisbane, Australia, No. 10, November, 1911.

[16] *Amer. Journ. Science,* June, 1911.

Portions of the hind limb, arm, skull, ribs, ventral scutellæ or abdominal ribs and portions of about thirty vertebræ are briefly described. The animal is compared with *Compsognathus,* to which it is closely allied and the new generic and specific terms, *Podokesaurus holyokensis,* are proposed. The specimen has been sent to Yale University Museum, where it will be prepared and further described by Dr. Lull.

Osborn[17] has given a discussion of the "Crania of *Tyrannosaurus* and *Allosaurus,*" illustrated with many beautiful figures, photographs and drawings. The discussion of the osteology of the skulls is based on the most recent nomenclature of the cranial elements and the various specimens are figured from many points of view, so that the reader gets an adequate notion of the appearance of the skulls of these remarkable dinosaurs. The figures (Plates III and IV) of the brain cavity, which is figured from the dorsal side in Fig. 17, will be of great interest to the general zoologist.

> Comparison of the intracranial cavity of *Tyrannosaurus* with the mid-section of the skull of *Sphenodon* and brain *in situ* as figured by Dendy shows that the intracranial cavity in *Tyrannosaurus* corresponds with the outer surface and foldings of the *dura mater* and is thus merely a cast of the outer envelope of the brain, which gives us little idea either of the form or size of the brain itself. . . . The cast of *Tyrannosaurus* gives us a means of measuring the size of the *dura mater* envelope. It displaces 530 cubic centimeters of water. If the brain proper bore the same proportion to the *dura mater* envelope as that of *Sphenodon,* the bulk of the brain of *Tyrannosaurus* may be estimated at 250 cubic centimeters.

This sized brain in a skull 50 inches in length would not indicate a high degree of intelligence.

Further on in Part II of the same memoir the same author discusses "Integument of the Iguanodont Dinosaur *Trachodon,*" based on a marvelously complete "mummy" discovered in the Cretaceous of Converse County, Wyoming. The "mummy" and the impressions of the skin are figured in several excellent halftone plates, with explanatory line drawings. Osborn says of the skin:

> Properly speaking the skin is not squamate, or imbricating, as in the lizards, but is rather tuberculate. There is no evidence of a squamous overlapping, or of an imbricating arrangement of the scales anywhere.

Although this bipedal dinosaur when standing erect attained a

[17] *Memoirs of the American Museum,* N. S., Vol. I, pt. 1, 1912.

height of 14 feet the individual tubercles are of very small size, never attaining a greater diameter than 5 millimeters. The paper closes with a reconstruction of *Trachodon mirabile* Cope in two attitudes, bipedal and quadrupedal and a discussion of a "Theory of Color Pattern" and "Habits of the Trachodonts." In regard to *Trachodon annectans* Osborn says:

> If the animals had spent any considerable part of their lives on dry land, even on the sands bordering the streams, the effect of the impact would certainly be observed in the retention of hoofs or ungues, in the coarsening of the palmar epidermis of the manus, because the fore limbs would certainly have been used occasionally, at least, in contact with the earth. There are no hoofs and the epidermal thickenings or pads are very lightly developed.

The conclusion then seems to be that the animals were largely aquatic.

The same author in Part III of the same series gives the attempts to arrive at some definite system of measurements for mammalian skulls with especial reference to the horse, in a paper entitled "Craniometery of the Equidæ." The author divides the discussion into (I) *Craniometric Systems, 1875–1912;* in which is given the results of the labors of Franck, 1875; Branco, 1883; Nehring, 1884; Tscherski, 1892; Salensky, 1902; Ewart, 1907; Bradley, 1907; and Osborn, 1912, the discussions being illustrated by figures and tables. (II) *Distinctions between Horses, Asses and Zebras.* (III) *Cytocephaly, the Bending of the Face on the Cranium,* the chief conclusions of which are: (1) in young animals the palatal and cranial lines are more nearly in the same plane; (2) in certain animals the deflection increases rapidly with age; (3) a horizontal and upward deflection is generally characteristic of primitive browsing types; (4) the downward deflection of the face and palate is highly characteristic of certain grazing types. (IV) *Craniometry and Odontometry in Paleontology.*

> In fossil skulls the *indices* lose value because the slightest degree of crushing or distortion seriously disturbs an index. Nevertheless the indices and ratios should be used wherever obtainable. Since fossil skulls and dental series are rarely complete or perfect, the paleontologist requires an additional series of detailed measurements of parts of the skull not needed by the zoologist.

Harold J. Cook in Volume 7, Parts 3, 4, and 5, of the Nebraska Geological Survey has given descriptions of a new genus and

two new species of Miocene rhinoceroses and a "Faunal Lists of the Tertiary Formations of Sioux County, Nebraska." These formations extend from the Lower Oligocene to the Pleistocene and many species are listed, 11 pages being taken up with the lists. Peterson,[18] however, states that one of the above species was based on a deciduous dentition.

Dr. R. S. Lull in the *Yale Alumni Weekly* of November 8, 1912, gives a very interesting account of his expedition to Texas in search of the remains of early horses, which he found in abundance.

Broili[19] has described very carefully a new specimen of *Pterodactylus micronyx* H. von Meyer from the lithographic slates of Eichstaedt in Bavaria. The nearly complete animal is seen from the dorsal side as it lies in the stone.

The same author[20] describes and figures very fully the osteology of the skull of *Placodus* based on a series of specimens of this peculiar, primitive, yet highly specialized reptile. On page 151 are given four reconstructions of the dorsal, ventral, lateral and occipital views of the skull. The animal is very peculiar in many ways and of very uncertain relationship, being assigned to several reptilian groups by the various authors who have studied the species. The maxillary and palatine teeth have the unusual form of pavement crushing teeth, the palatine teeth are especially large and broad, the middle one of the three on each palatine measuring nearly one by two inches. That the animal was a feeder on molluscs or hard vegetation would seem quite probable. Zittel in his "Handbuch der Paleontologie" lists six species of this genus; the one described by Broili being *P. gigas* Ag. The animal possesses a single temporal opening in the skull and amphiplatyan vertebræ, with the nostrils located far back on the skull with the nasals reduced, indicating an aquatic habit of life.

In the *American Journal of Science* for November, 1912, S. W. Williston describes and figures further portions of the osteology of the peculiar Permian reptile *Limnoscelis* from New Mexico, together with a restoration of the skeleton of the species *L. paludis* Will. Nearly the entire osteology of the species is

[18] *Science*, December 6, 1912, p. 801.

[19] *Zeitschrift der Deutschen Geologischen Gesellschaft*, Bd. 64, Jahrg. 1912, H. 3.

[20] Paleontographica, Bd. LIX, pp. 149–155, with figures and Taf. XIV.

known and much of it is preserved intact. Only a few caudal vertebræ and a few spines of the vertebræ are unknown, which for a fossil form is remarkable. In regard to the habits of the animal the author says:

> Taking into consideration the very short and stout legs with their broad flattened feet, the absence of claws, the elongate body and tail, it would seem not at all improbable that *Limnoscelis* was more or less at home in the water, though not strictly an aquatic animal. In much probability it lived in and about the marshes on the mud flats. . . .

From the press of the E. Schweizerbart'sche Verlagsbuchhandlung Nägle und Dr. Sprösser, Stuttgart, 1912, is a volume entitled "Grundzüge der Paleobiologie der Wirbelthiere," von O. Abel, professor of paleontology in the University of Vienna. The work comprises an octavo volume of 708 pages with 470 figures and a photographic reproduction of the skeleton of *Cryptocleidus oxoniensis* Phil. as mounted in the American Museum. The work is dedicated to Louis Dollo, professor of paleontology in Brussels. The work is divided into four sections as follows: (I) Geschichte und Entwickelung der Paleontologie, (II) Die Ueberreste der fossilen Wirbelthiere, (III) Die Wirbelthiere im Kampfe mit der Aussenwelt, (IV) Paläobiologie und Phylogenie. The work is too extensive for an adequate review in this place and it will suffice to say here something of the manner of treatment of the subject matter of the volume. The usual systematic method of compiling a paleontological work is not followed but the subject matter is presented from the standpoint of the adaptation of the animal to its environment and is thus very refreshing to the zoological paleontologists. Such items as the *auditory apparatus of the mosasaurs,* the *parietal organ, expansion of the thorax, dental reduction in the pterosaurs, convergence and parallelism, Todeskampf* are taken at random throughout the work to indicate the nature of the subject matter. Most of the figures are copied from the works of other authors but a few are new. Recent and extinct species are figured side by side when they illustrate the same biologic phenomenon, as for instance on page 438, the recent *Myliobatis aquila* is illustrated side by side with the silurian *Thelodus scoticus.* On page 214 he states that the present writer is mistaken in his correlation of the digits of the Branchiosauria and that the second finger has wrongly been regarded as the first. His reasoning is not adequate to sup-

port his contention. Why should we regard the first finger as having been lost? It would be interesting to have Abel's further views on this matter. The oldest amphibian has but four digits in the hand and they doubtless never had more, but we don't know. His discussion of the *origin of the thumb* is open to question as has been suggested by Doctor Matthew in a previous review of this work. The work as a whole is well printed; the illustrations are clear and show care in selection. The work is, I am sure, a welcome addition to our libraries.

Whatever we may think of the "Arachnid Theory" for the origin of the vertebrates, as outlined in Patten's "Evolution of the Vertebrates and their Kin," we must all acknowledge our debt to Professor Patten for the information on the oldest known vertebrates as outlined in Chapters XX and XXI of that work. Those of us especially who are engaged in the attempt of teaching something of the nature of the oldest known vertebrates must feel grateful to the author for the excellent discussions of these most interesting vertebrates, which he discusses and figures so fully and so beautifully. The text of these two chapters is illustrated with 33 exquisite drawings and photographs based on actual specimens or on the most authoritative works. The writer of these reviews feels a personal debt to Professor Patten for the figures of the left pectoral limb of *Eusthanopteron fordi* (Whiteaves) from the Devonian of Canada. He says of the limb that it

> indicates the way . . . in which the typical skeleton of the pectoral appendage of the tetrapoda has been derived from the biserial pectoral fin of fishes.

We should like to modify the sentence to say *may* instead of *has*, for no one knows whether or not this was the way of the origin of the tetrapodous limb. Restorations of *Cephalaspis, Lasanius, Birkenia, Thelodus, Lanarkia, Drepanaspis* and *Bothriolepis* are given, as well as two photographic pages of specimens of *Bothriolepis* as they occur in the rock; one slab containing nearly a dozen more or less complete specimens. By means of sections Professor Patten has arrived at some conclusions which seem to point, in his opinion, to the arachnoids. The structures he describes are certainly very interesting in their resemblance to arachnid structures. If his interpretation of their value is doubted he has the satisfaction of knowing that no better interpretation has been given. To say that they are characters due to parallelism is beg-

ging the question. If they do not indicate arachnid relationships what do they indicate?

Bertram G. Smith[21] gives a very interesting discussion of "Phylogeny" (in the Amphibia) in his valuable memoir on "Embryology of *Cryptobranchus.*" The keynote to his discussion is contained in the following sentence:

> In the present state of our knowledge it is impossible to reach an unqualified decision of the question under consideration. . . . Whatever light may be shed by future discoveries on the question of the derivation of the amphibia from the crossopterygia or the dipnoi it is clear that the point of origin is not far from either stock; in other words, that the three lines of descent have separated from a common stem at no very great intervals.

The discussion is illustrated by a figure of the pectoral limb of the crossopterygian *Sauripterus taylori* Hall, based on a specimen in the American Museum.

Louise Kellogg[22] has a very interesting paper on the "Pleistocene Rodents of California." The material described is from the cave deposits and the asphalt beds of California. The discussion is intended especially as an elucidation of the possible changes in climatic conditions during the Pleistocene as indicated by the rodent fauna. The species are listed according to the life zones which they indicate; the *Upper Sonoran, Transition* and *Boreal* all being indicated by several species; there being but slight indication of change since the time of deposition of the deposits. Two new subspecies are described.

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[21] *Journal of Morphology,* Vol. 23, No. 3, p. 540 ff.

[22] *Bull. of Dept. Geol. Univ. Calif.,* Vol. 7, No. 8, pp. 151–168.